AW139 Cat.A Operations

by Bernardino Paggi

AW139 Cat.A Operations

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Flight Envelope

- Maximum operating altitude: 20000 ft
- Ambient air temperature: -40ºC to ISA+35 (50ºC Max)
- Vne: 167 kts
- Max number of occupants: 17 (2 crew)
- Maximum gross weight for CAT A-B take-off/landing: 6400kg (14110 lb)
- Max T.O. Cat A-B altitude: 14000 ft Hp/HD
- Cat A T.O. & Landing Envelope maximum cross wind component 10 kts
- Min helipad size for the entire TDP-LDP range: 15x15 m (50x50 ft)

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Flight Envelope

- Max Crosswind for Cat.B T.O.&Landing: 40 kts
- No H-V at 6400 kg (Max T.O. Weight) Sea Level ISA+35 (50°C OAT)
- OEI ROC at: V_{TOSS}(40kts) > 400 fpm, V_Y(80kts) > 200 fpm (min spec engine, ISA+35, Sea Level and Max Weight)

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"Oversize Design Concept"

Helicopter*	Max Take Off Weight (kg)	Cont Power-to-T.O.Weight (2.5' or 30") ratio at 'Sea Level' (SHP/kg)
AB 412 EP	5398	**0.21**
BELL-430	4082	**0.21**
EC145	3550	**0.22**
S92	12020	**0.22**
EC155B	4800	**0.20**
S76C+	5306	**0.18**
AB 139	**6400**	**0.26 (+13% to +44%)**

* Data Source: FAA Data Sheet

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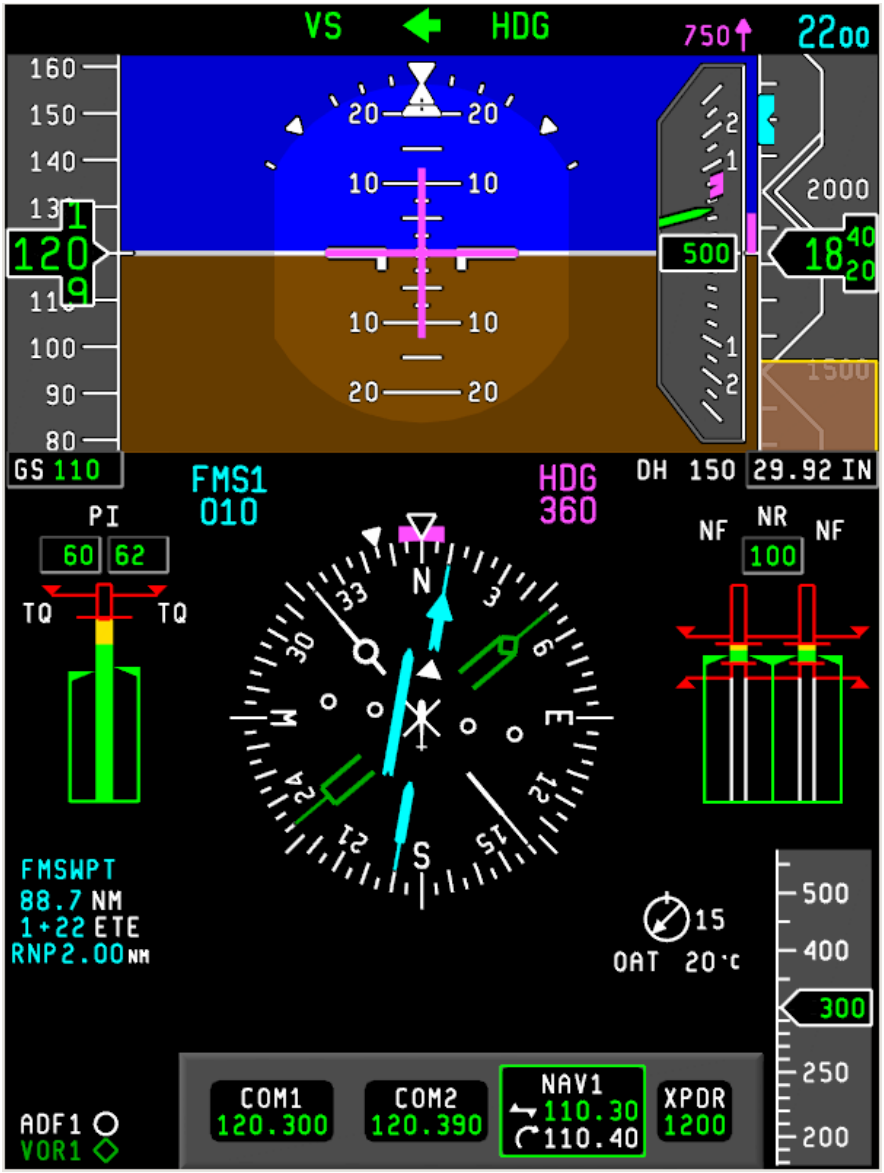

Power Index PI (Not FLI)

First ever EASA/FAA Primary Flight Display certified with all primary engine information condensed in **One Instrument !**

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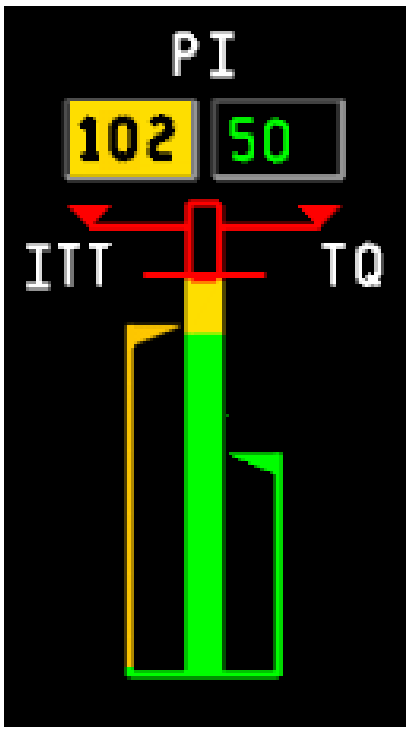
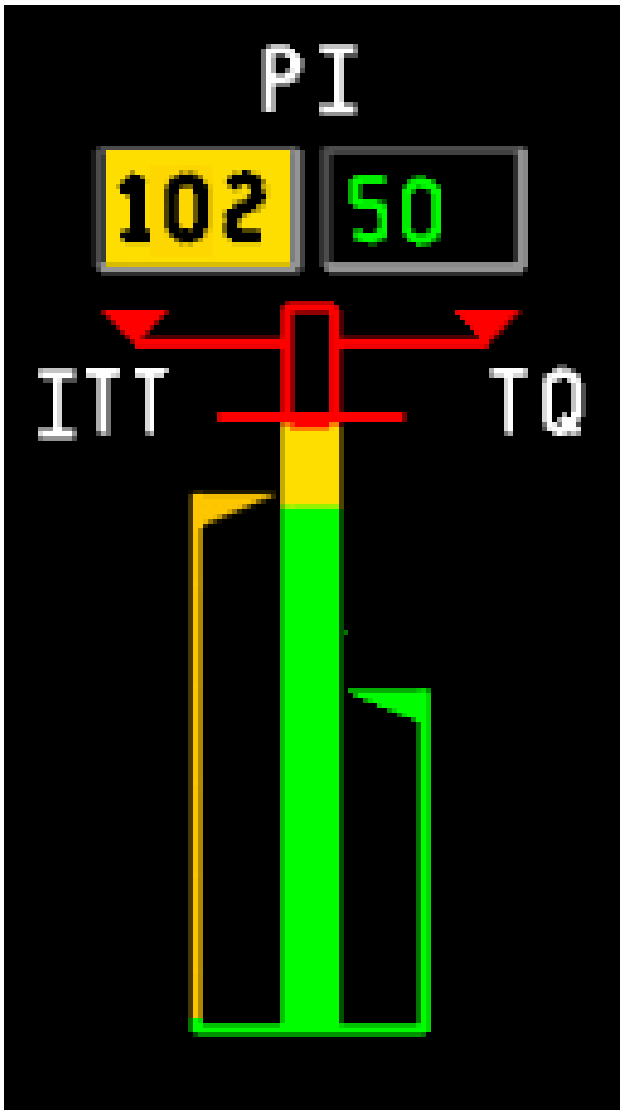
Increased Safety with Power Index (all engine information in primary field of view with only one instrument – Reduced Pilot Workload)



Why PI?

- To enhance safety
- To reduce workload
- To provide correct indications of engine status and power delivered



Power Index PI (Not FLI)

When the indication approaches the first limit of the engine, whenever this limit is different from the torque, pointers and digits continue to provide percentage of power used. Indication takes care of the different possible ratings (MCP/TOP AEO, MCP/2,5' OEI).

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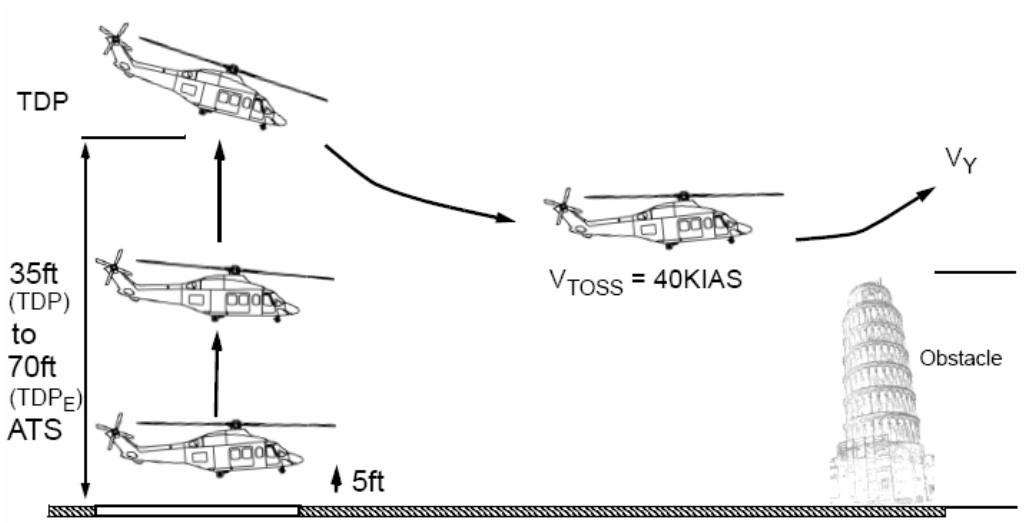
Take-Off

The Category A procedures are constructed to allow different Take-off sites to be used.

- For a Ground Level or Elevated Heliport/Helideck, without obstacles in the take off flight path, the Vertical procedure with TDP fixed at 35ft can be used.
- If, however, there are obstacles in the take off flight path, then the Vertical procedure with an Extended TDP (TDP_E) can possibly be used up to a TDP height of 70ft ATS to obtain the required clearance over the obstacle.



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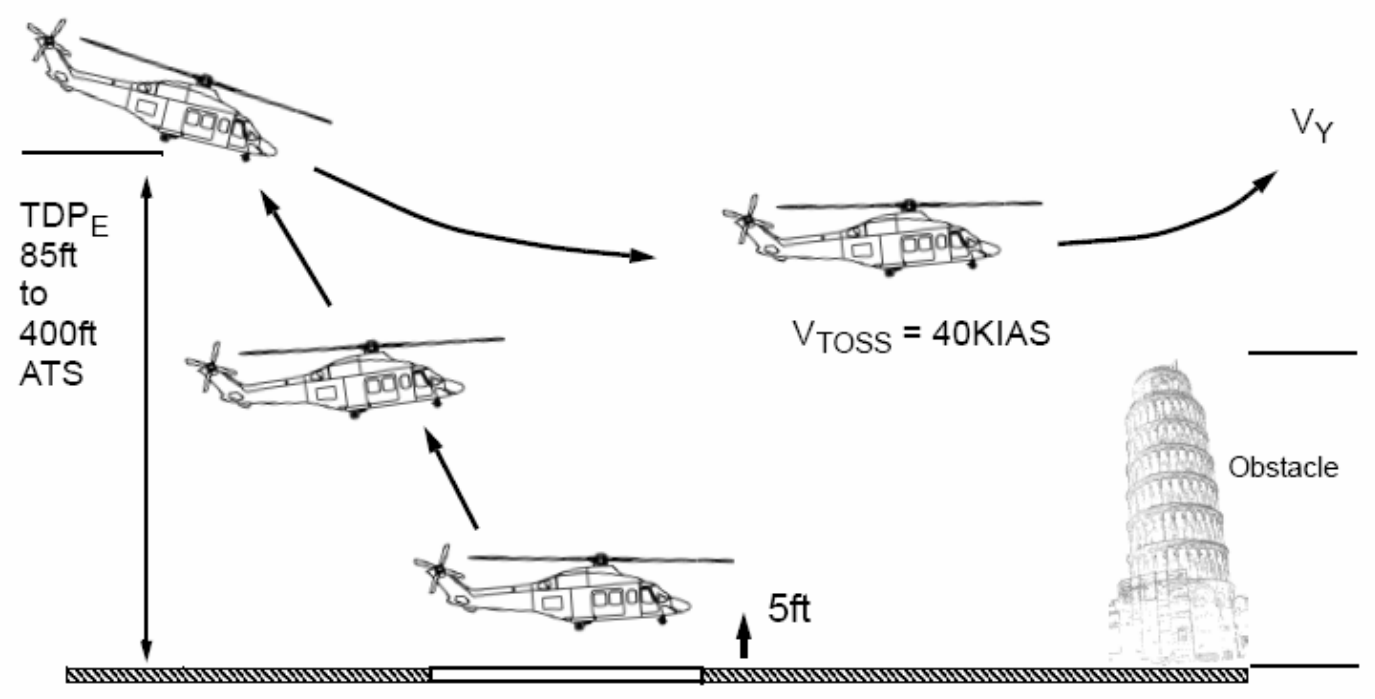
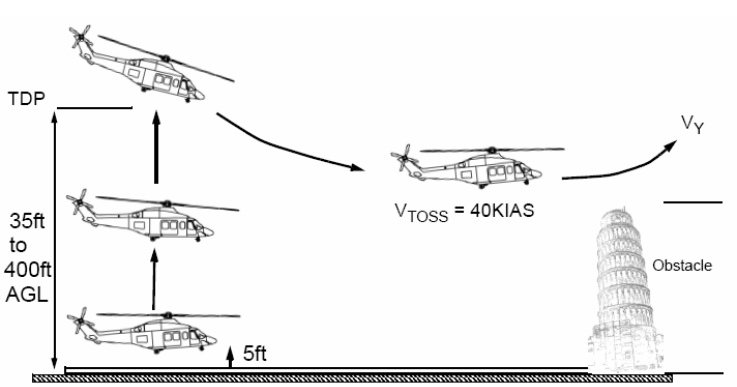
Take-Off

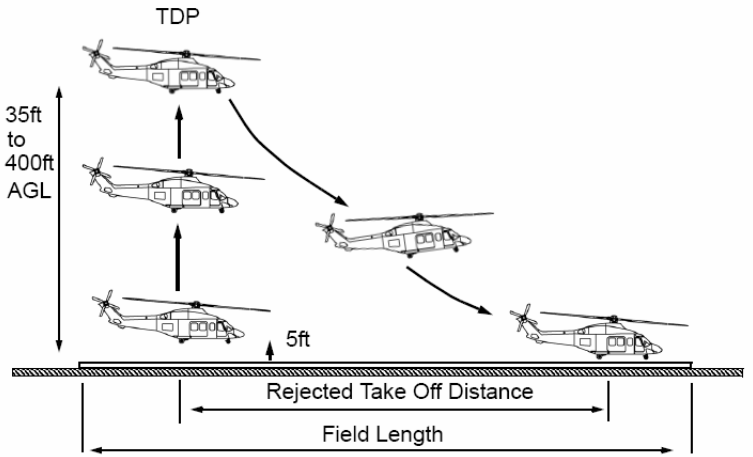
- If the maximum TDP_E is not sufficient to clear the obstacle then the Heliport Back Up technique could possibly be used as this has a higher maximum TDP_E of 400ft ATS.



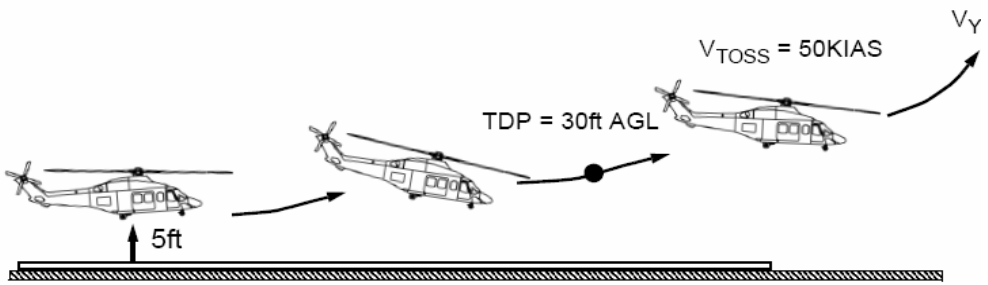
Take-Off

- A Short Field Technique, with a vertical climb to a TDP_E up to 400ft AGL, is available if there is sufficient surface to carry out a Rejected Take Off.





- A Clear Area Take-Off technique, using a runway, is also available.



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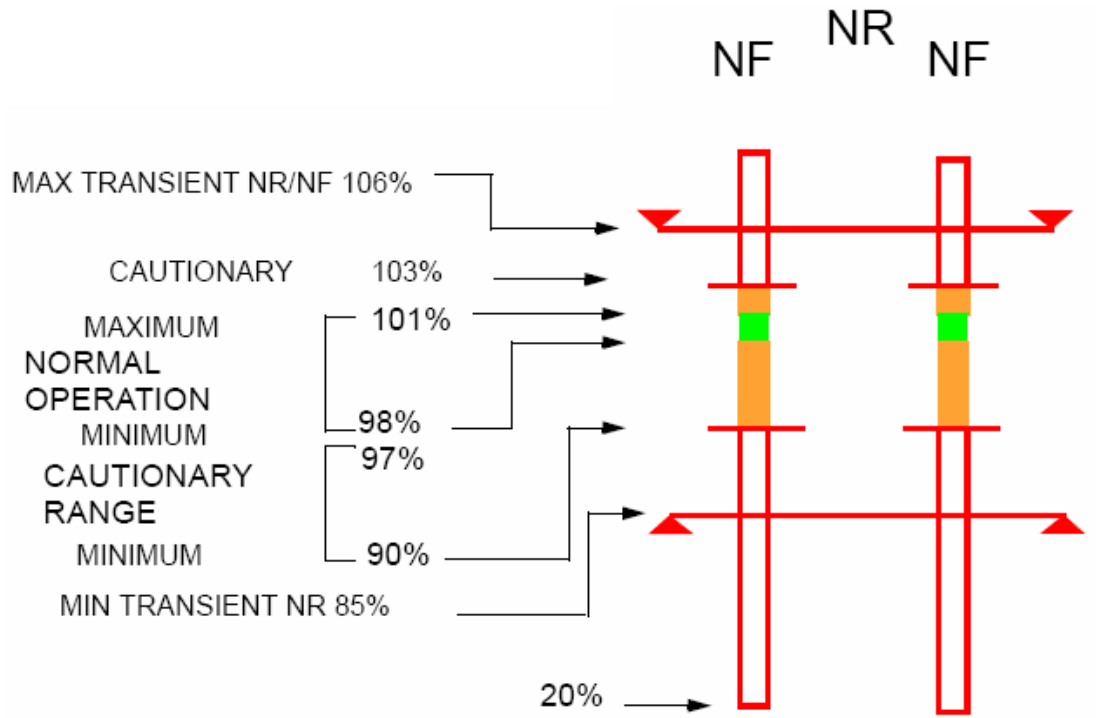
ROTOR SPEED LIMITATIONS

All Engines Operating:

- CAT A Take-Off and Landing below 90 KIAS: 102%

One Engine Inoperative:

- Minimum Transient: 85%
- Minimum Cautionary: 90%



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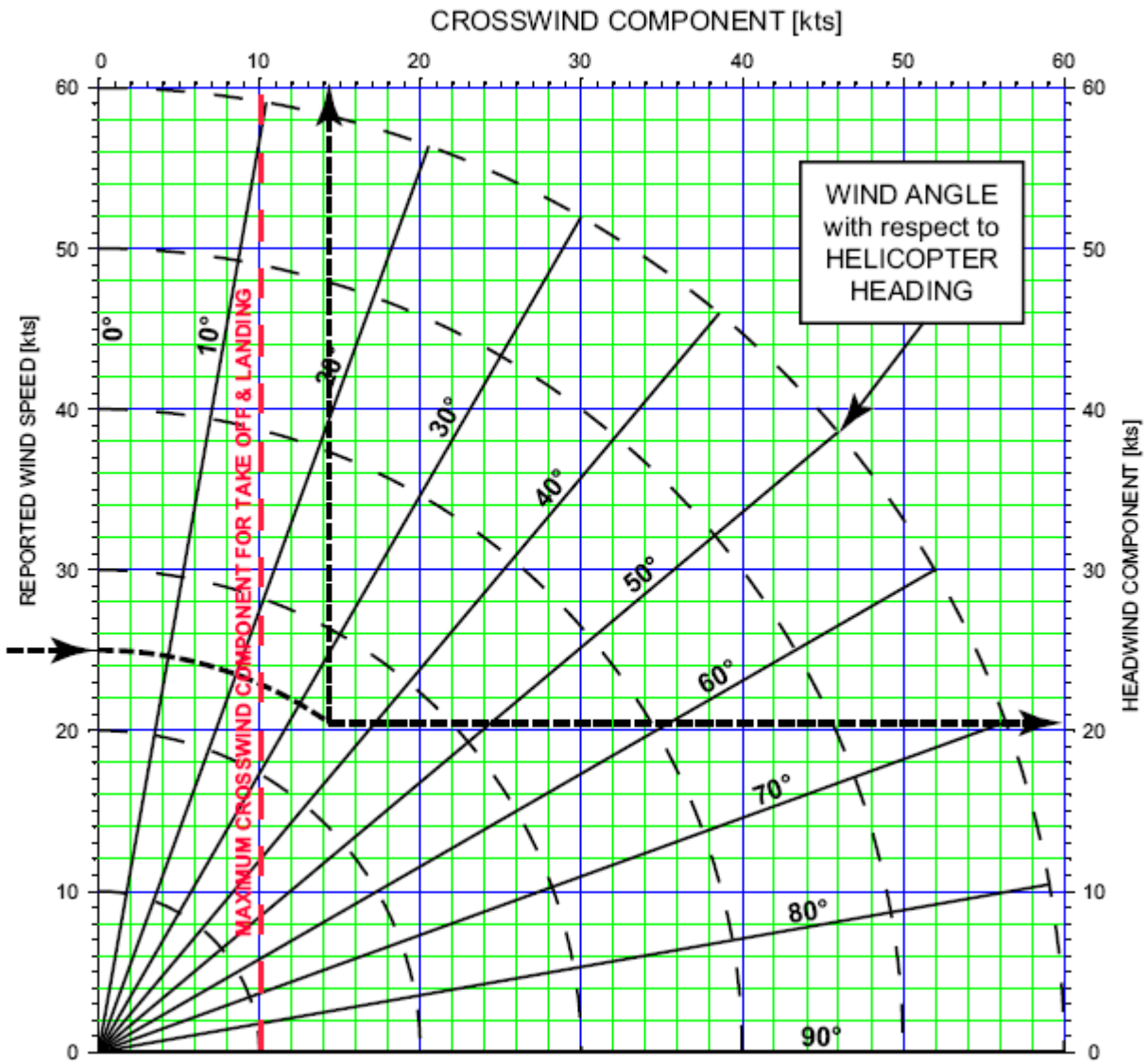

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Headwind Gross Weight Benefit

- The Gross Weight Benefit, incorporated into the W.A.T. Charts for Headwind Component is factored by 50%.
- No further weight correction is necessary.
- The Distance Correction incorporated into the “Heliport CTO Distance OEI” chart for Headwind Component is factored by 50%.
- Mean Height Gained in 100ft (30m) Horizontal Distance are provided for both TAKE-OFF FLIGHT PATH 1 and Path 2

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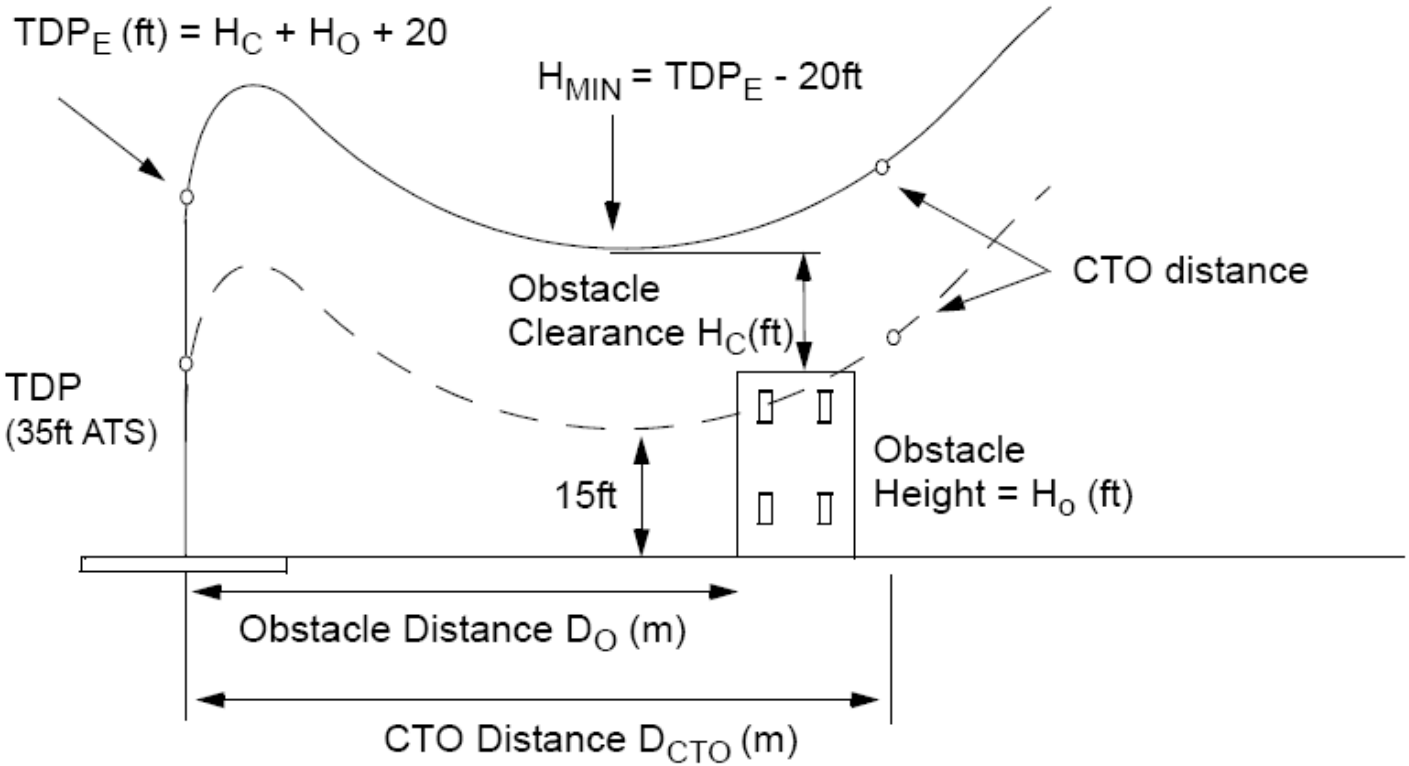
Extended TDP_E

- TDP_E height, necessary to safely clear an obstacle positioned along the Take-Off path, is calculated from known Continued Take-Off distance, distance and height of the obstacle from Take-Off point

- A Take-Off procedure with a TDP of 35ft ATS would guarantee a minimum height of 15ft ATS. However, for obstacle clearance this height must be increased by a value dictated by Operational Rules.

Extended TDP_E

- If the obstacle is within the CTO distance for the Gross Weight and Ambient conditions then the minimum TDP_E height can be calculated



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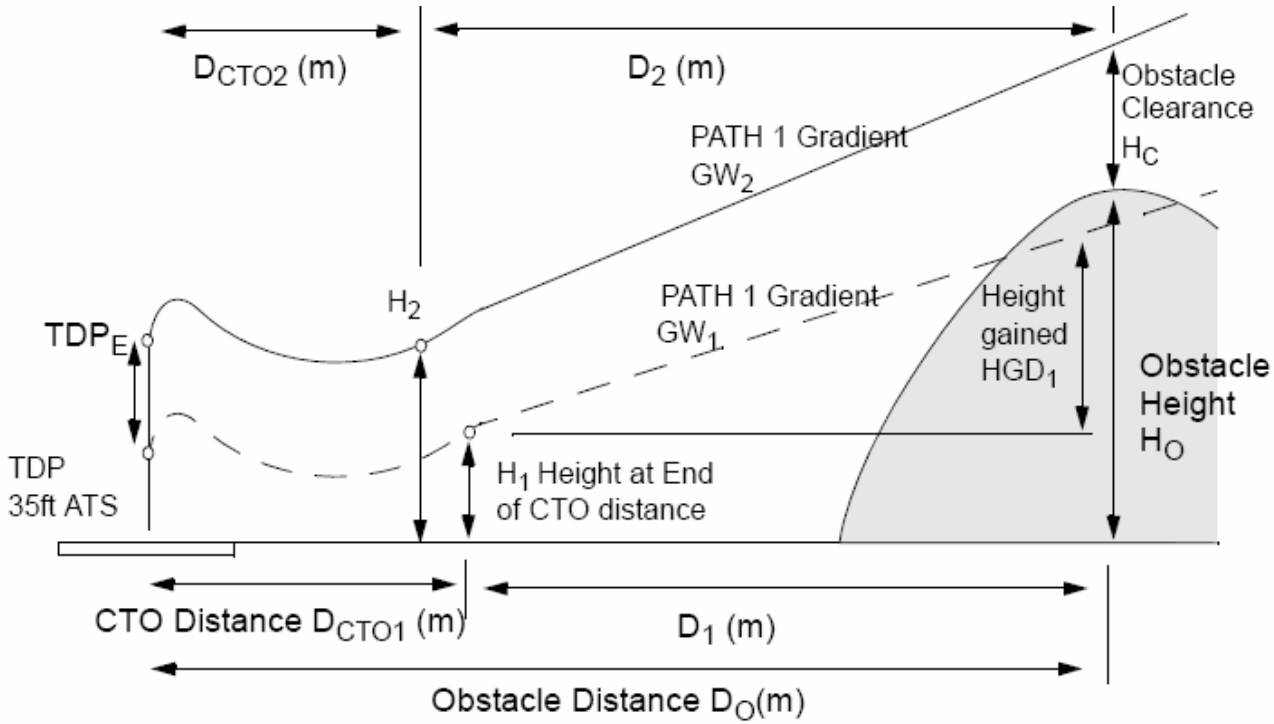
Extended TDP_E

- If the obstacle is after the CTO distance and in the PATH 1 (up to 200ft ATS), then obstacle clearance can be achieved by a TDP_E or a reduction in Gross Weight (which will increase the PATH 1 climb gradient) or a combination of TDP_E and reduction in Gross Weight.

- The relative effectiveness of TDP_E or PATH 1 gradient change will depend on the distance of the obstacle.



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Influence of turns during Path 2 climb

EFFECT OF TURN ON PATH 2

Bank Angle	15°	30°
Gradient correction	-3 ft	-9 ft
Distance travelled for 10° of Heading change	566 ft 172 m	262 ft 80 m

Distance traveled for a 10 degree of heading change and reduction in height gain over a distance of 100ft (30m) in the Take-Off flight PATH 2 gradient

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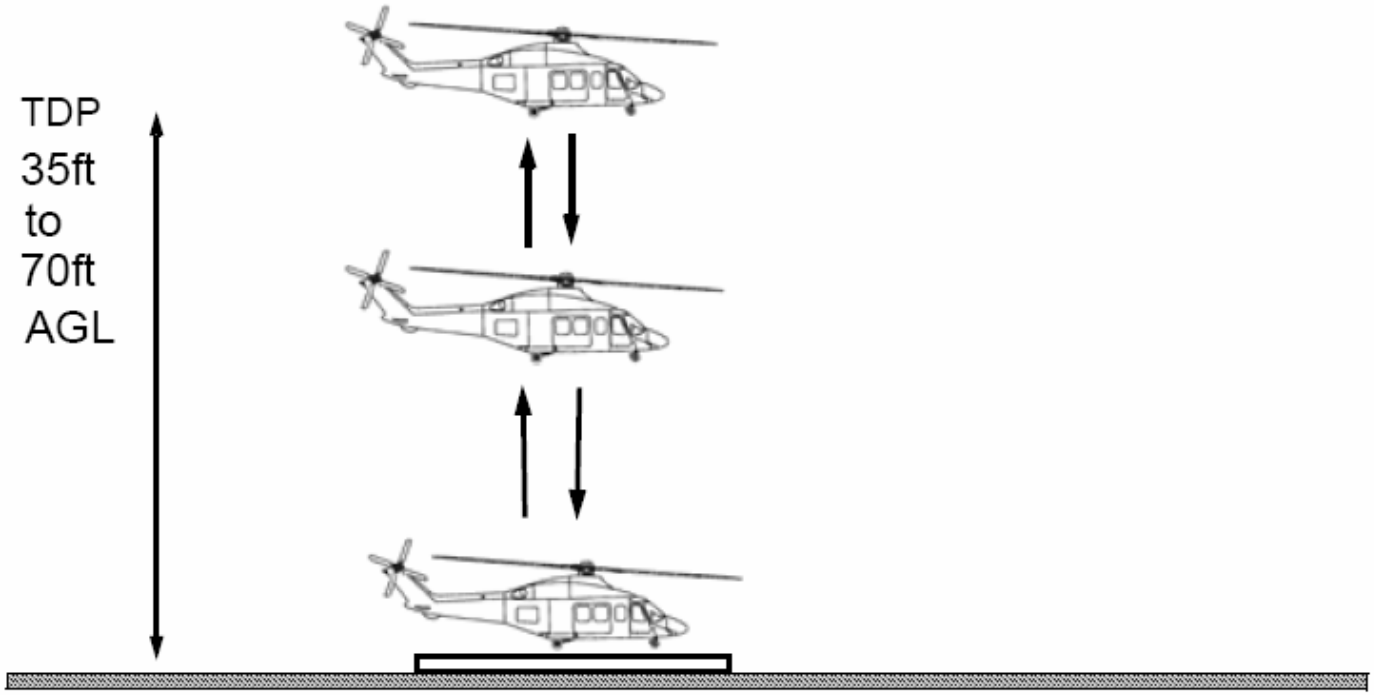

Ground Level/Elevated Helipad, Variable TDP 35ft to 70ft AGL Engine Failure at/before TDP

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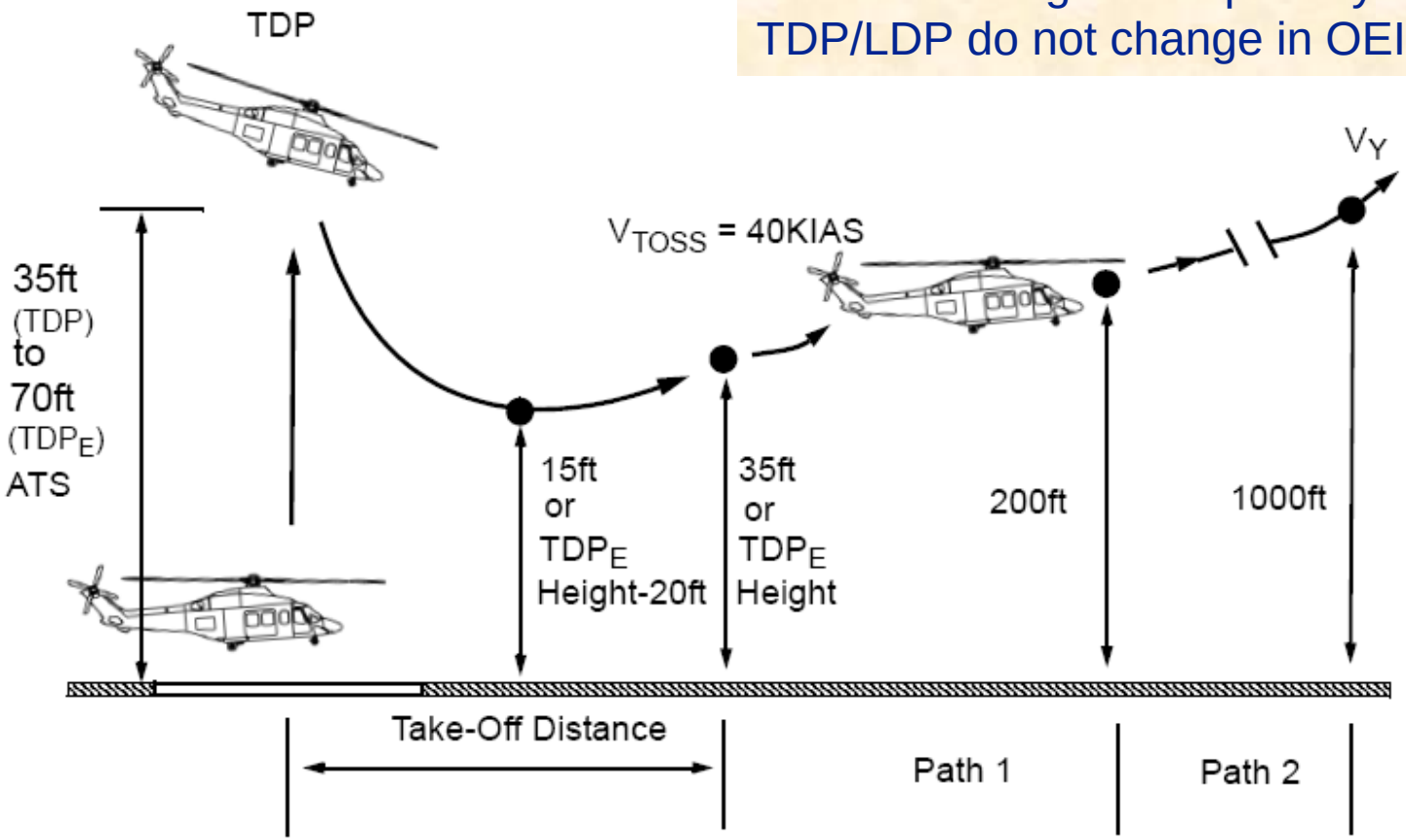
SINGLE ENGINE FAILURE RECOGNIZED AT OR AFTER TDP (CONTINUED TAKE-OFF)

T.O. & Landing technique beyond TDP/LDP do not change in OEI



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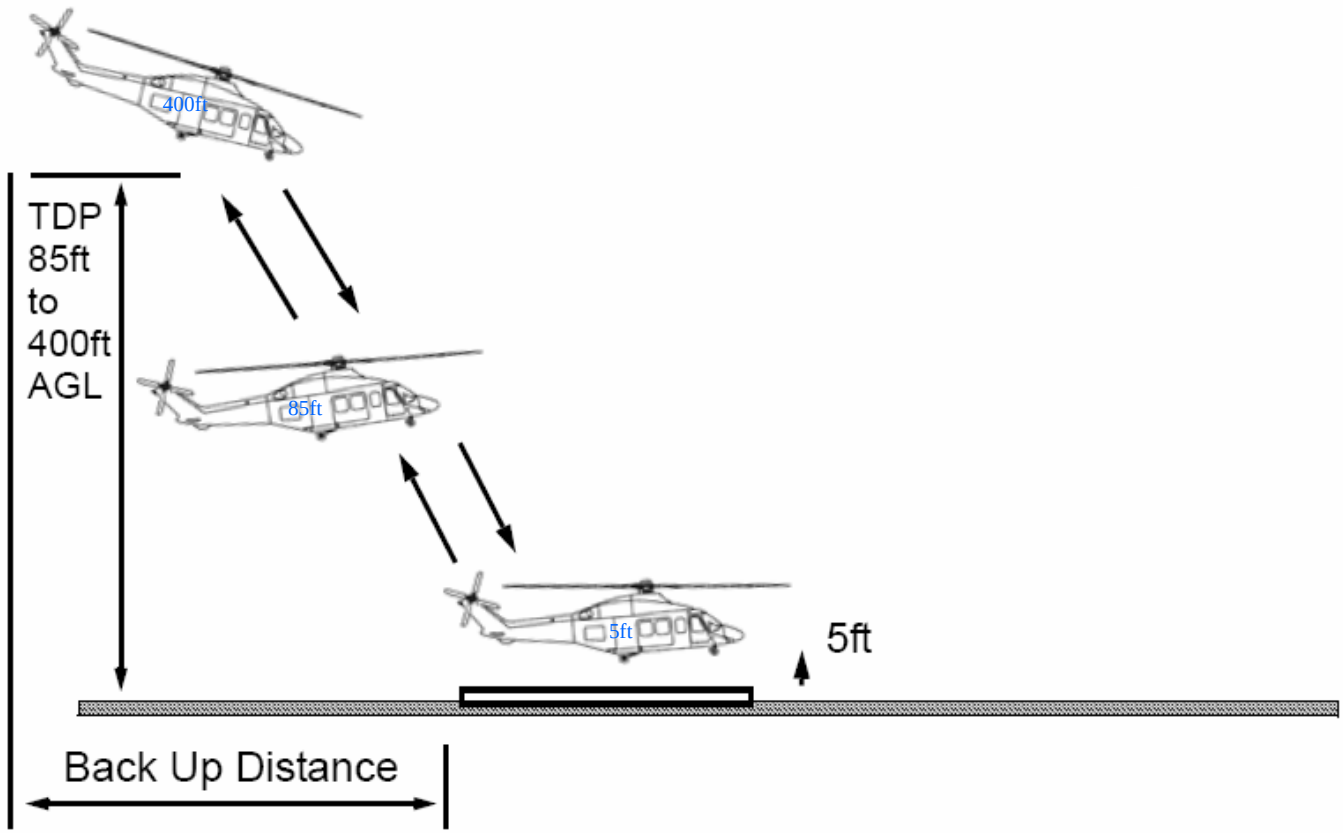


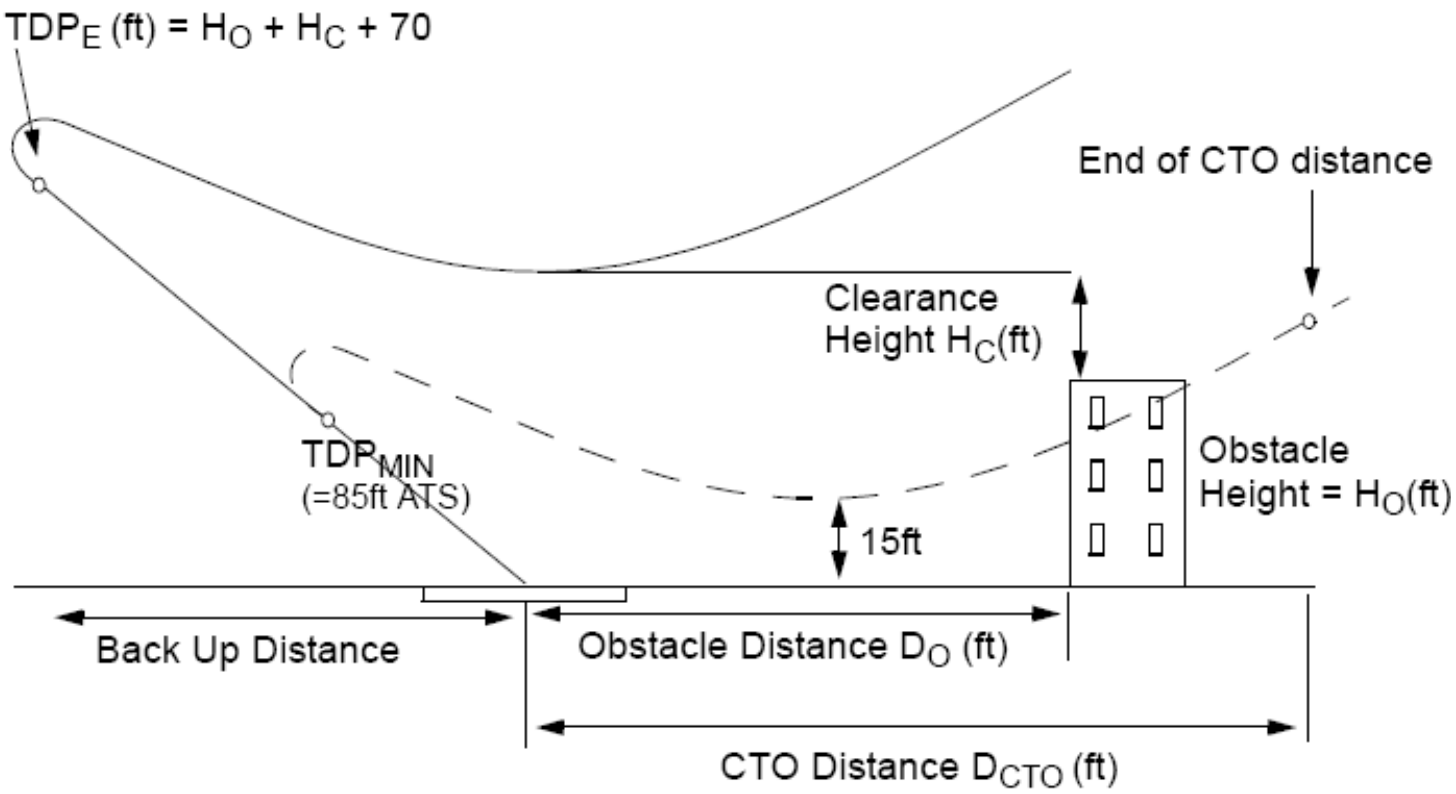
Helipad Backup Techique Engine Failure at/before TDP

Figure 2C-5 Heliport Back Up Take-Off - View at 400ft ATS

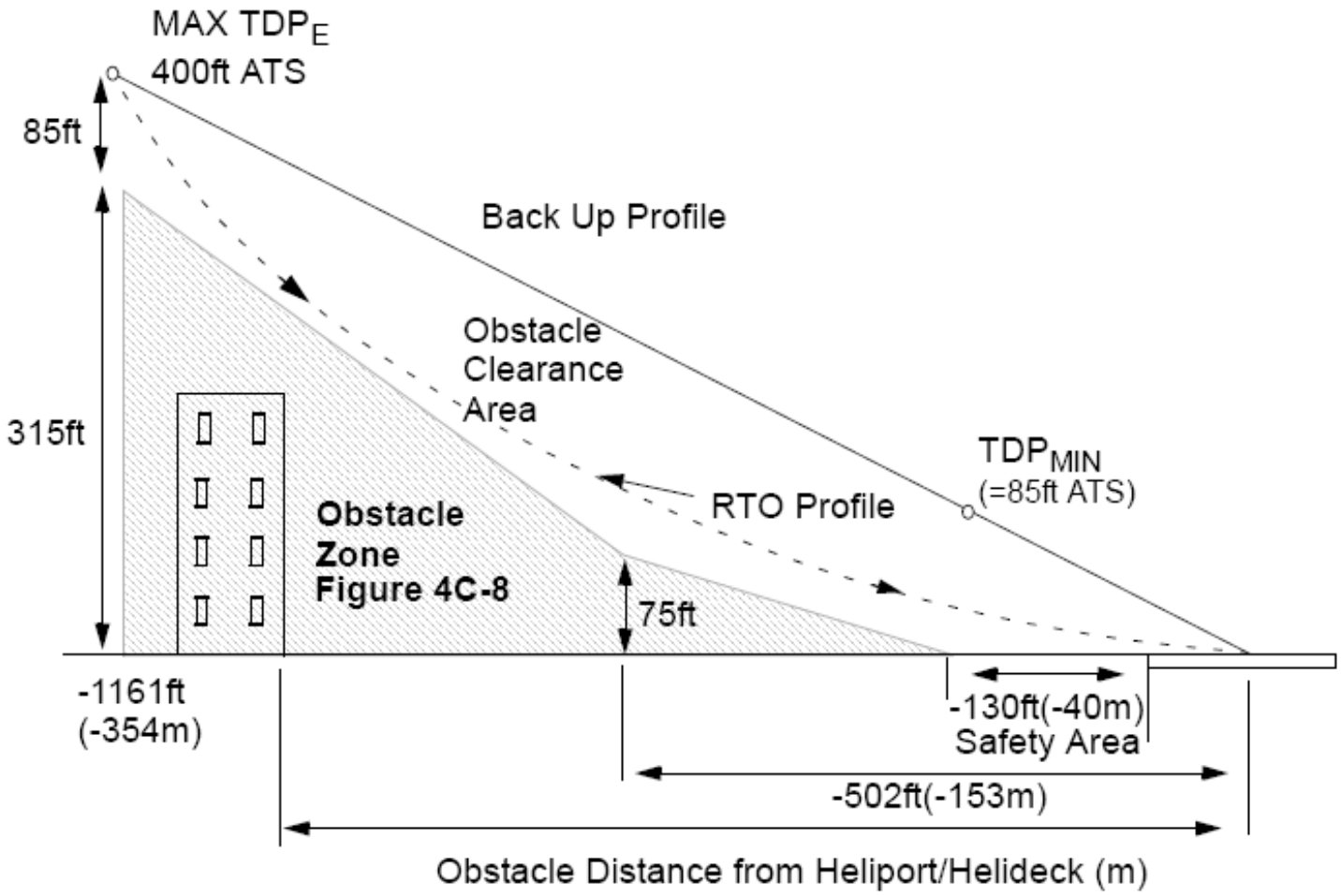
Figure 2C-3 Heliport Back Up Take-Off - View at 85ft ATS

Figure 2C-2 Heliport Back Up Take-Off - View at 5ft ATS

TDP_E for obstacle inside the CTO distance

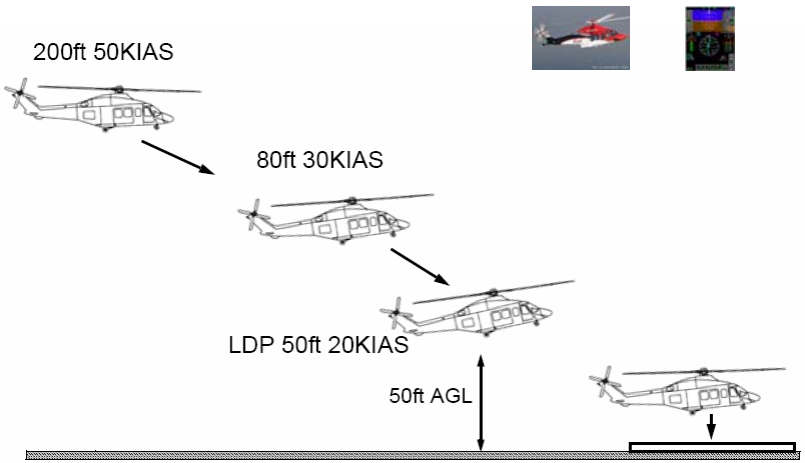


TDP_E for obstacle under back up profile



Landing

- A heliport Landing technique is available with an LDP fixed at 50ft for unobstructed sites, and a Variable LDP (LDP_V) up to 400ft ALS, for sites with obstacles in the Balked Landing profile.
- A Clear Area technique for operation onto a runway with a fixed LDP is also available.



Landing Profile, Helipad Techniques

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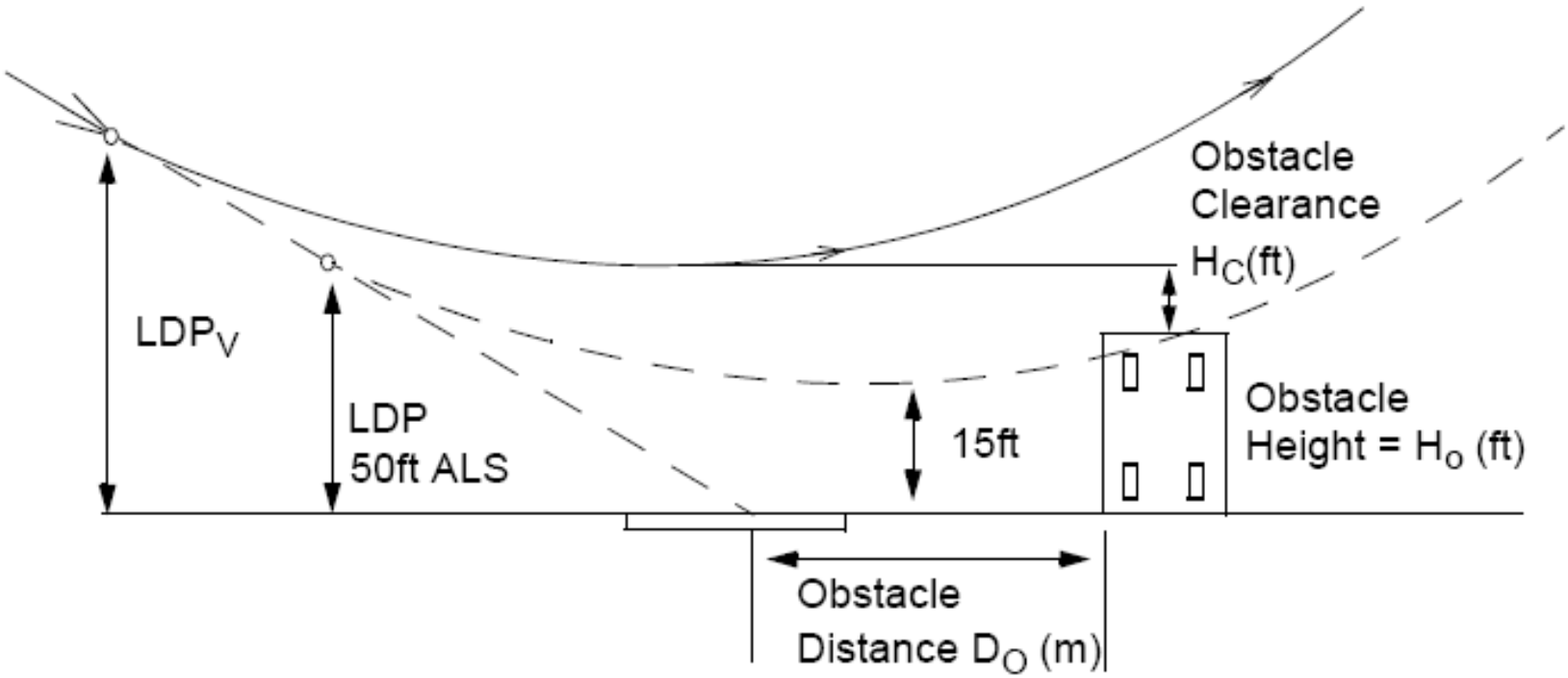
LDP_V with obstacle in Balked Landing Profile



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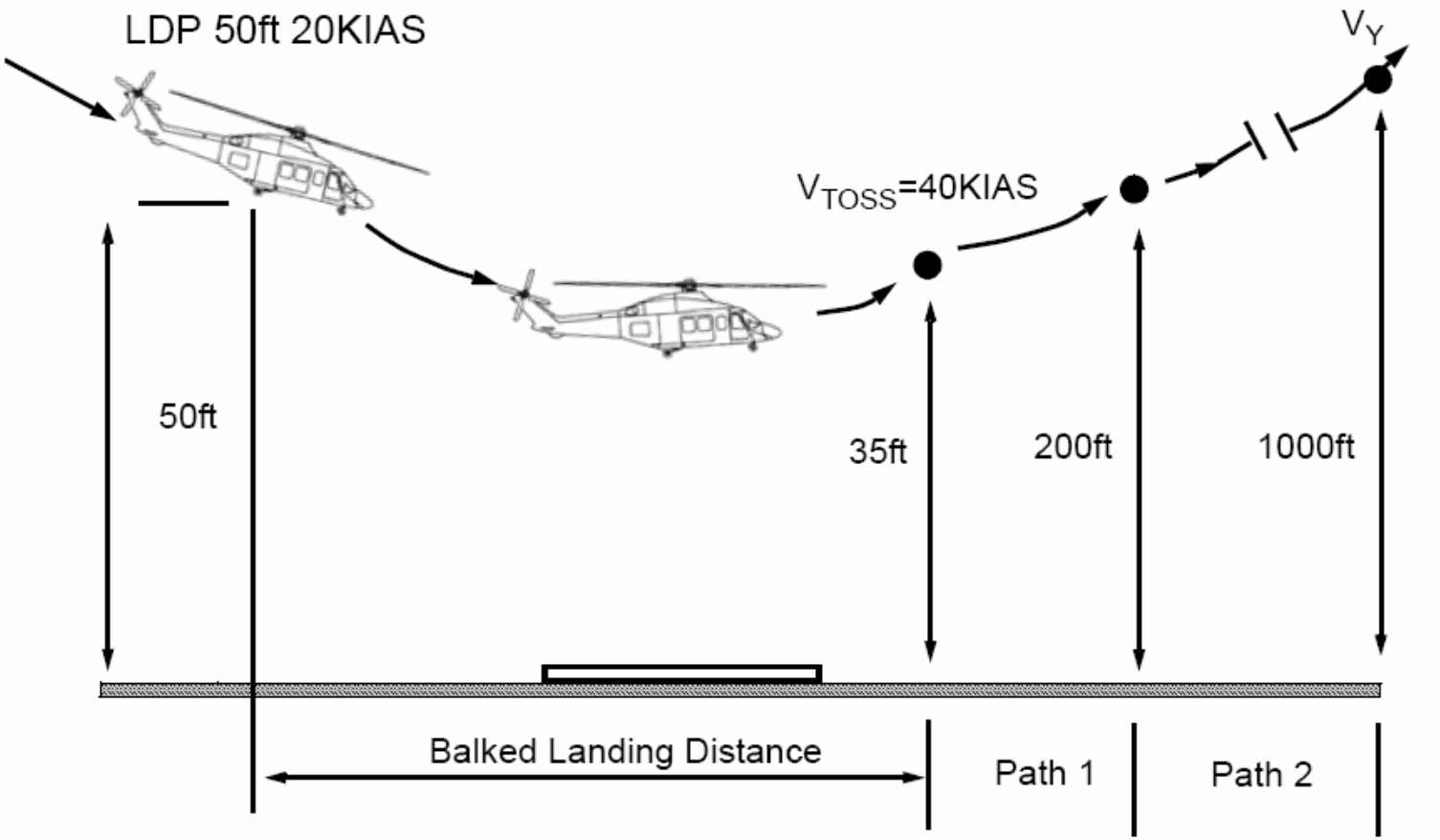

All Helipad Techniques Balked Landing, Engine Failure before/at LDP

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Offshore Operations

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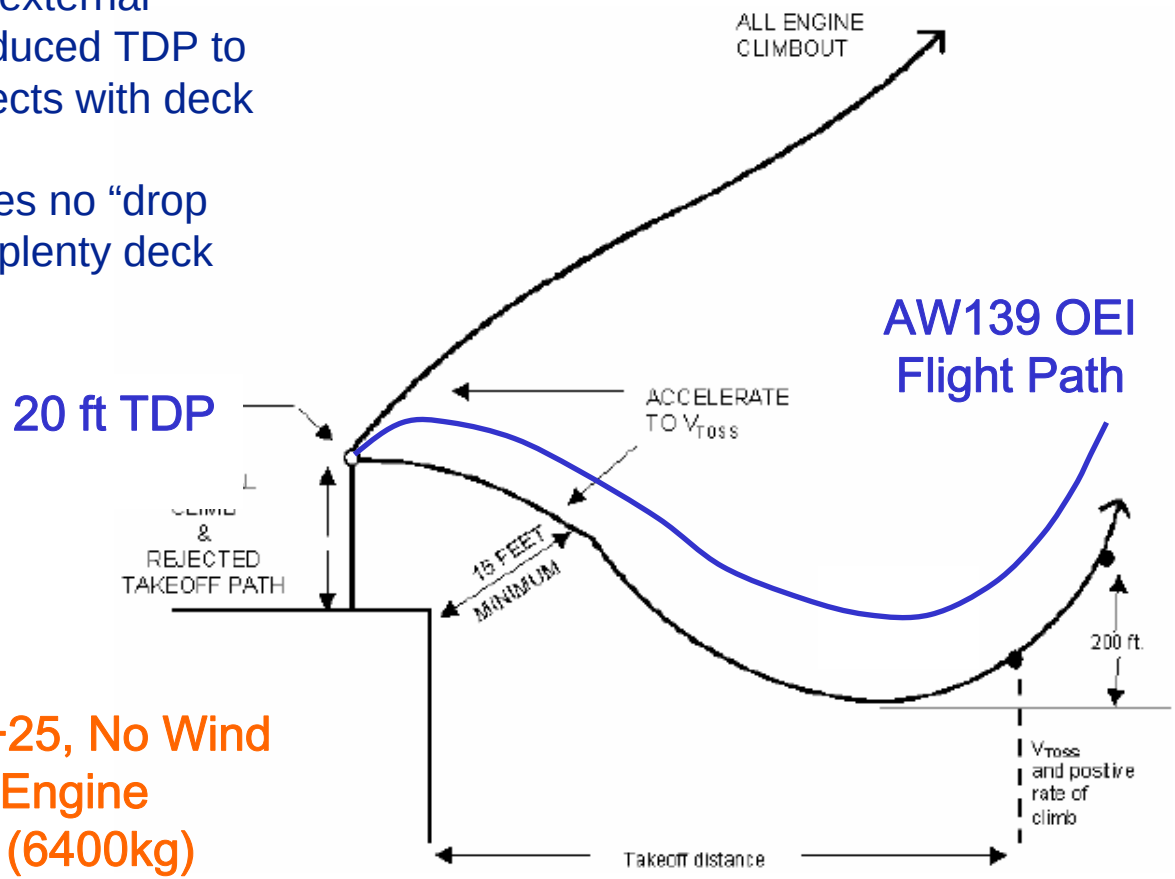
Offshore Tailored Operations

- Oilrig decks with no external references require reduced TDP to allow safe vertical rejects with deck in view
- 20 ft TDP still requires no “drop down” technique and plenty deck border clearance



Sea Level, ISA+25, No Wind
Min Spec Engine
Max Weight (6400kg)

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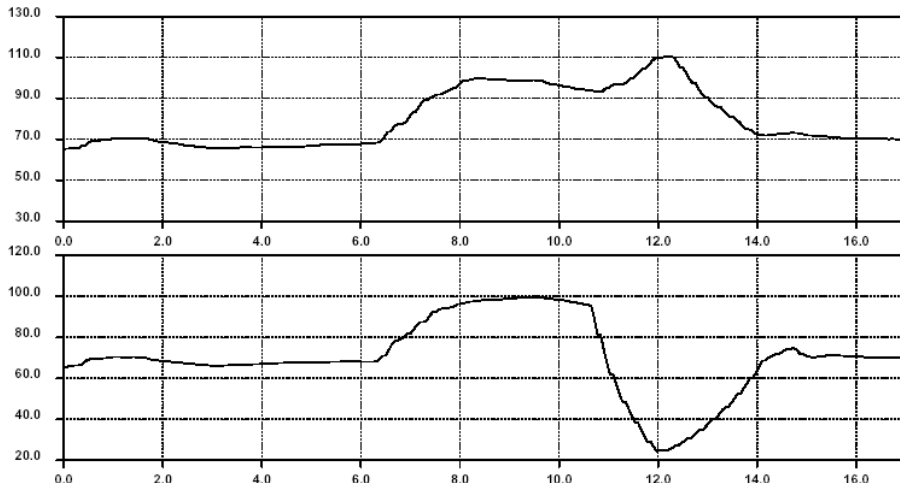
Training Mode

- The Category A Training Procedures are supplied to allow Category A Emergency Procedures to be carried out at low Take-Off gross weight and at reduced 'OEI power' in order to conserve engine and transmission life

- The Training Mode logic uses **twin engine power** to simulate an initial 'single engine' transient to 'maximum torque' and rotor droop. Both engines are used.



In order to simulate the transient following an engine failure the engine selected to OEI TNG will accelerate to a maximum of **110% torque** (MFD display) then reduce to approximately **70%** while the 'inoperative' engine will decelerate to a minimum of approximately **25% torque** then accelerate to around **70%**

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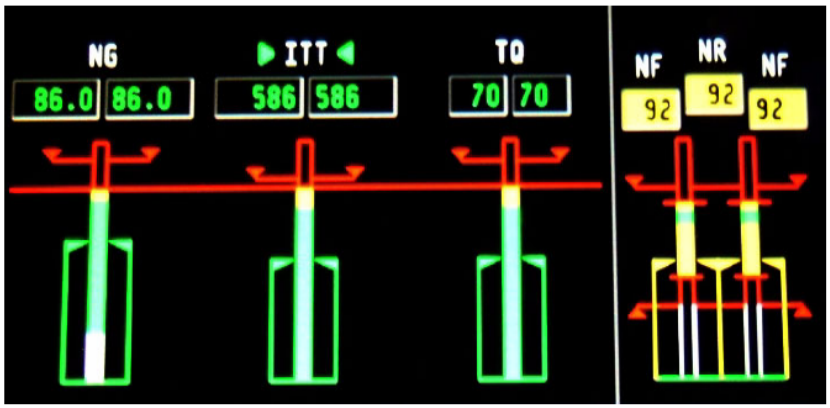
Training Mode

- When the Training Mode is activated, the PI and NF displays, on the PFD, are artificially configured to show OEI condition for the engine selected to OEI TNG.

- PFD presents the simulated OEI condition while the MFD, for safety reasons, presents the real AEO conditions



MFD Display in OEI TNG

PFD Display in OEI TNG

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Questions?